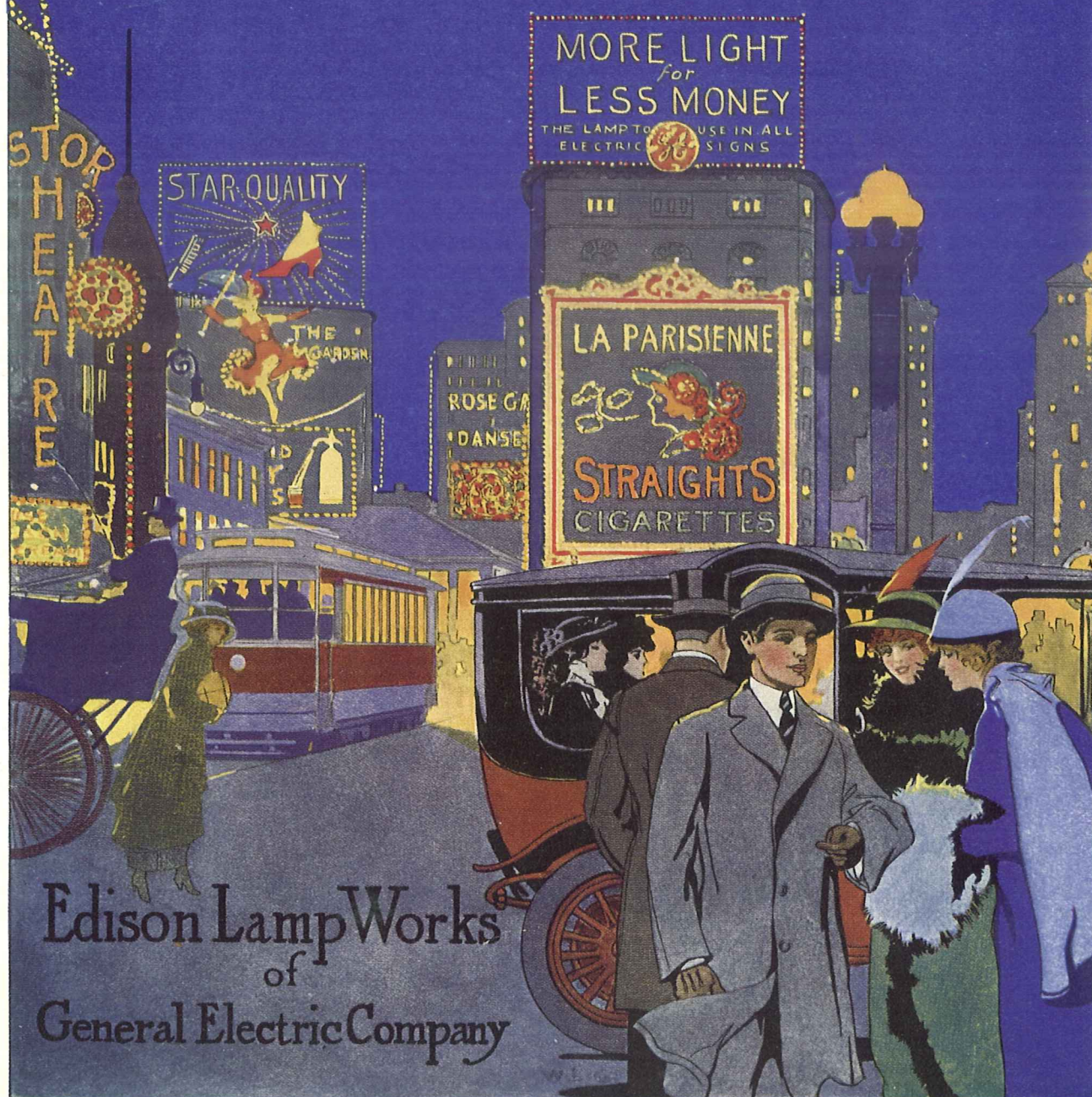


Sign Lighting with EDISON MAZDA LAMPS



Edison Lamp Works
of
General Electric Company

Edison Lamp Works

of General Electric Company

GENERAL SALES OFFICE, HARRISON, N. J.

March, 1915

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Bulletin No. 43550

EDISON MAZDA SIGN LAMPS

During the middle ages every trade had its characteristic emblem; the bush was the usual sign of the tavern, the mortar and pestle designated the apothecary's shop and the tourniquet and bandage became the barber's pole. During the sixteenth and seventeenth centuries painted signs came into vogue and have ever since been of such importance that some of the greatest artists, including Correggio, Paul Potter, Hogarth and Sir J. E. Millais, considered such advertising worthy of their handiwork.

Like lightning on the midnight sky, the modern sign flashes with incandescent brilliancy. Artists today have almost unlimited facilities for depicting lines and masses in glowing color, beautiful in harmony or contrast; even motion is faithfully reproduced. The message is blazoned forth, everyone reads and everyone stops to marvel at the scenic display or to wonder at the perfection of the galloping horses or the skirt fluttering in the breeze.

Electric signs thus have an advertising value so far beyond that of ordinary painted signs that the two are hardly comparable. No other form of advertising actually compels attention like the electric sign. It is not that "he who runs may read," but he who runs must read. The merchant of today who ignores the electric sign is closing his shutters while the greatest crowd is passing.

Electric signs are the most striking and dignified advertising media in use today. Their popularity and efficiency are attested by the remarkable increase in their number and the wide range in service to which they

have been put. The secret of success in this kind of advertising lies in the fact that it is simple, effective and cheap. Every new sign erected is a silent recommendation to the business getting ability of those already in operation.

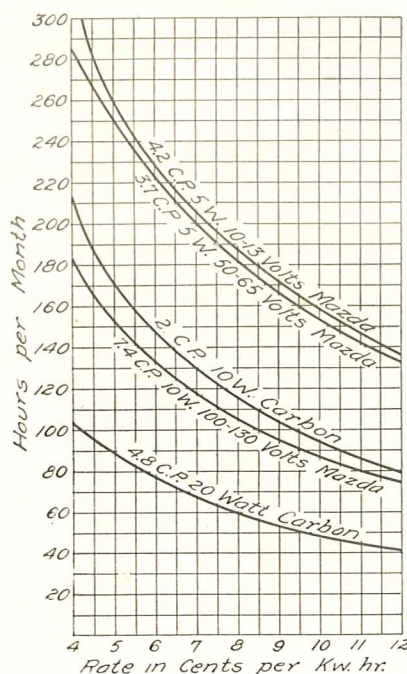
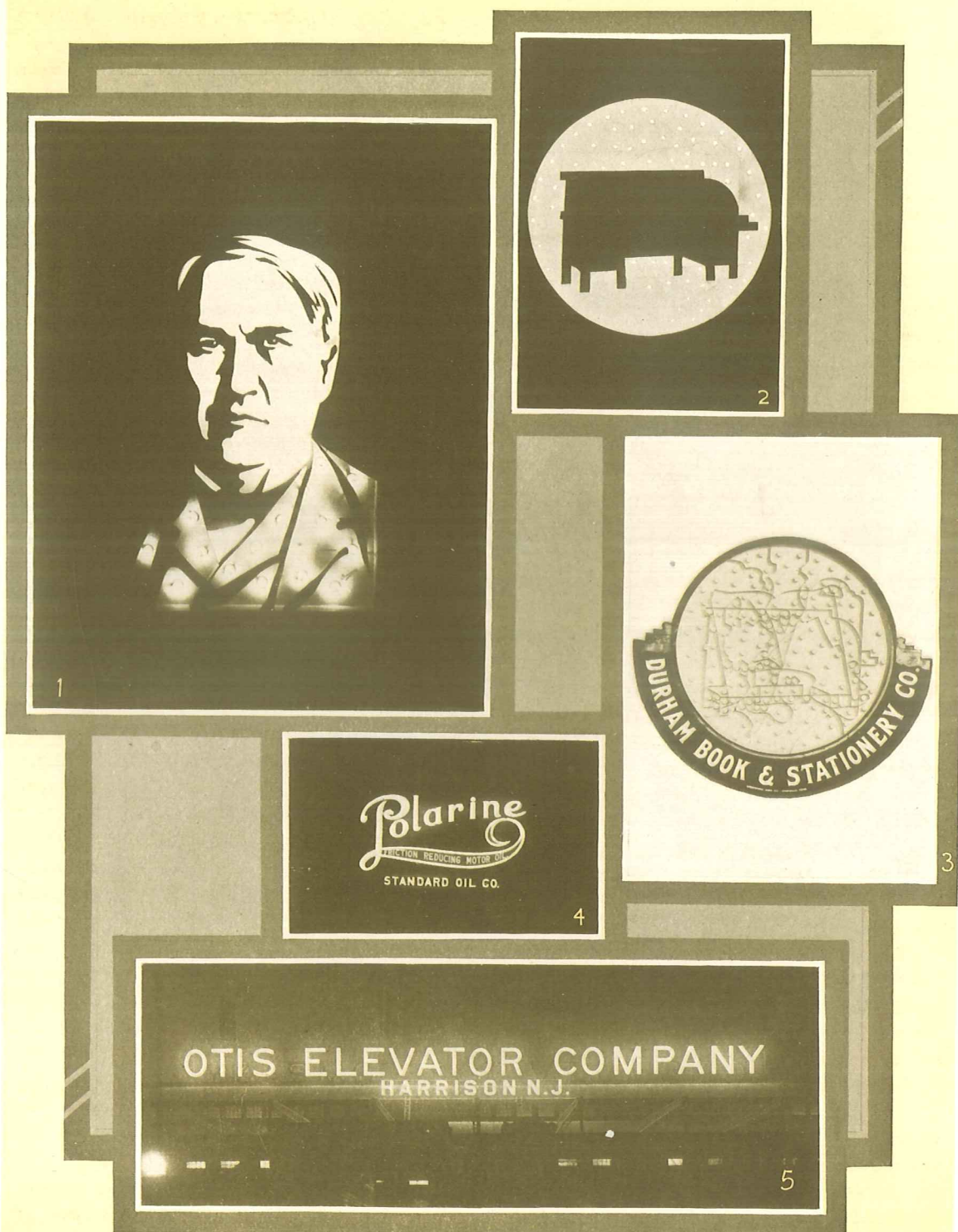


Fig. 1

CURVES SHOWING THE NUMBER OF HOURS PER MONTH A SIGN OF 100 LAMPS OF VARIOUS TYPES CAN BE OPERATED FOR A TOTAL COST OF \$10

Until recently, however, the cost of operating a sign was comparatively high because of the fact that it was only possible to use the relatively inefficient carbon lamps. Since the development of high efficiency MAZDA lamps this objection has been removed. In



- (1-2-3) EDISON'S PICTURE, DURHAM BOOK AND STATIONERY CO.—The sign is divided into a number of different compartments, and by confining the light to definite compartments a number of effects can be produced. The shadow effect on a bright background makes this sign very attractive.
- (4) POLARINE—That the Standard Oil Company appreciates the value of electric signs is shown in this case. 756 5-watt lamps are used in this sign which is located in Atlanta, Ga.
- (5) OTIS ELEVATOR COMPANY—This sign is lighted with 1500 10-watt EDISON MAZDA sign lamps. These lamps are wired two in series across 220 volts, the wiring being similar to that shown in Fig. 6.

fact, the carbon lamp, being obsolete, will not be considered in this bulletin, which is to represent only the latest and most improved practice in sign lighting.

EDISON MAZDA Sign Lamps and Merchants

MAZDA sign lamps have put electric advertising within the reach of everybody. Their wonderful efficiency and long life have made electric sign advertising particularly attractive and profitable for both the merchant and central station.

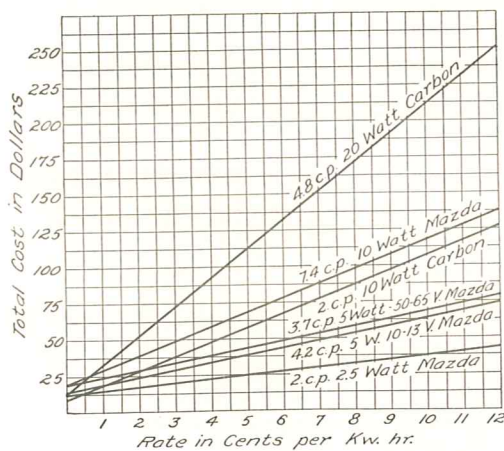


Fig. 2

CURVES SHOWING TOTAL COST OF OPERATING 100 LAMPS OF VARIOUS TYPES FOR 1000 HOURS. (APPROX. ONE YEAR)

The cost of operating a sign has been so reduced that it is now the cheapest, as well as the most effectual, form of advertising. It is now possible for every merchant to enjoy the advantage of electrical display and advertising. In addition the EDISON MAZDA lamp gives a much better quality of light, which makes it more desirable for advertising purposes; it emits a bright, white light, which gives it a peculiar attention-compelling power and makes those signs using EDISON MAZDA lamps shine out with a brilliancy heretofore considered impossible.

The cost of operating a sign containing EDISON MAZDA lamps is less than one-half as much as the cost to operate a carbon

sign of equivalent candle-power, as is shown in Figs. 1 and 2. A sign of 100 5-watt lamps has an operating cost of but five cents per hour at 10 cents per kw-hr., and by burning this sign for five hours every night in the month the monthly expense will be but \$7.50. Compare the results obtained with the publicity which would result from a like expenditure in any other field.

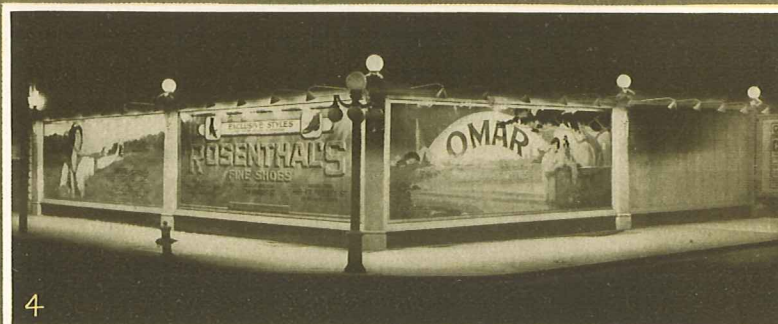
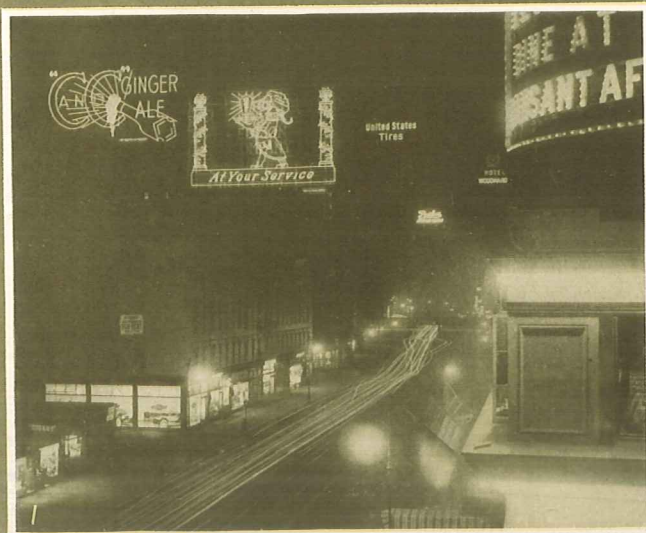
EDISON MAZDA Sign Lamps and the Central Station

The problem of increasing the revenue from its sign lighting business is ever present with every central station. In many of the large cities sign lighting campaigns are carried on, without doubt resulting in an increased revenue from this very desirable class of business.

The recent improvements and developments in the EDISON MAZDA sign lamp will be of great assistance to the central station. Heretofore, because of the limitation of the series system of wiring for sign lighting, central stations supplying direct current have been handicapped; but with the perfection of the new 105-125-volt sign lamps all this difficulty has been overcome.

Central stations now supplying direct current are, therefore, in a position to solicit sign lighting business as successfully as those companies supplying alternating current; while it is now as advantageous for every lighting company to solicit an increase in its service of sign lighting as in its service of store, factory or household lighting.

The fact that the MAZDA sign lamp consumes less current than the former carbon lamp has not, in the experience of the central station, operated to their detriment. It has so far been proved a fact that the MAZDA lamp has, instead of reducing the revenue to the central station, increased it, and in addition to this it has improved the load factor, a very important consideration. In fact, the MAZDA lamp has proved a benefit to the merchant-consumer of light, as well as a revenue producer to the central station.



- (1) NEW YORK EDISON COMPANY—The sign is 50 feet long and contains approximately 3600 MAZDA sign lamps.
- (1) C. & C. GINGER ALE—The sign is 50 feet high by 125 feet long. The bottle is 64 feet long by 25 feet wide. The "C" is 52 feet high. There is a total of approximately 3000 10-watt sign lamps in this sign.
- (2) HOUSE OF MOVIES—A striking and unusual sign in San Francisco, Cal. The main spectacular feature consists of an immense electric fountain, waterfall and a large ball which turns over and over as the water strikes it. The fountain itself is yellow and amber, the water red and green and the revolving ball is red. Approximately 2300 EDISON MAZDA lamps are used.
- (3-4) OMAR CIGARETTES—This gives a day view of a billboard located in San Francisco. It is illuminated with 100-watt MAZDA lamps placed in special reflectors. A night view is also shown.

Characteristics of the EDISON MAZDA Lamp

In Table I is given a complete schedule of sign lamps with their technical data. They are now made in three voltage ranges: 10-13, 50-65 and 105-125 volts, thus making it possible to use them on any standard lighting circuit, either for alternating or direct current.

The EDISON MAZDA lamps operate at an efficiency of 1.3 watts per candle as against 4.0 to 5.0 watts per candle for the old carbon sign lamps. The 4-candle-power carbon sign lamp consumes 20 watts, while the MAZDA lamp of equal candle-power consumes only five watts. This high efficiency is due to the improved tungsten filament.

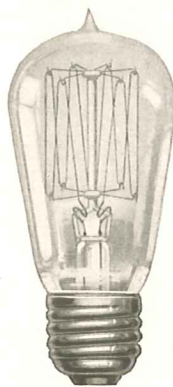
Voltage

An electric sign, in order to be effective, should be brilliant. In order that the lamps give normal candle-power and brilliancy, they must operate at labeled voltage. In other words, the voltage at the lamp should correspond to the voltage marked on the label.

The Edison Lamp Works rate sign lamps at an efficiency which will give a reasonably long life and there is no reason why any customer should "play safe" and operate the lamps under voltage, since this will cause a marked decrease in the candle-power and brilliancy of the sign and thus detract from its appearance. A 10-watt, 115-volt



5-Watt Sign Lamp
50-65 Volts (S-14 Bulb)



10-Watt Sign Lamp
105-125 Volts (S-14 Bulb)



2.5- and 5-Watt Sign Lamp
10-13 Volts (S-14 Bulb)

The drawn wire has another great advantage over the pressed filament: It is absolutely uniform and can be drawn to exact sizes. It is, therefore, possible to select the present MAZDA lamps very closely for amperes and volts; this being responsible for more uniform performance and longer life.

Below are given a few recommendations to be observed in ordering MAZDA sign lamps.

MAZDA sign lamp loses $3\frac{1}{2}$ per cent in candle-power for every volt it is operated under voltage. Therefore a 115-volt lamp operated on 113 volts will give only 93 per cent of its rated candle-power. A $2\frac{1}{2}$ - or 5-watt, 10- to 13-volt lamp will lose approximately 14 per cent in candle-power for every half-volt it is operated under voltage. Therefore the $11\frac{1}{2}$ -volt lamp operated on 11 volts will lose 14 per cent in candle-power.

TABLE No. I
TECHNICAL DATA COVERING THE COMPLETE SCHEDULE OF MAZDA SIGN LAMPS

Voltage	Rated Watts	Rated W.P.C.	Mean Horizontal C-P.	Average Total Life	Standard Package Quantity	BULB		Maximum Length Overall	Base
						Style	Diameter		
10- 13	$2\frac{1}{2}$	1.20	2.1	2000	100	S-14	$1\frac{3}{4}$	4	Std.
10- 13	5	1.15	4.3	2000	100	S-14	$1\frac{3}{4}$	4	Std.
50- 65	5	1.35	3.7	2000	100	S-14	$1\frac{3}{4}$	4	Std.
105-125	10	1.35	7.4	2000	100	S-14	$1\frac{3}{4}$	4	Std.

In order that there may be no misunderstanding, Table II gives a number of circuit voltages and also the voltage of the sign lamp to order, to give the best results at the circuit voltage.

TABLE NO. II
VOLTAGE OF LAMPS TO ORDER

Circuit Voltage at the Sign	10-Watt (105-125 Volts)	5-Watt (50-65 Volts)	2½- and 5-Watt (10-13 Volts)
110	110	55	11
111	111	55	11
112	112	56	11
113	113	56	11½
114	114	57	11½
115	115	57	11½
116	116	58	11½
117	117	58	11½
118	118	59	12
119	119	59	12
120	120	60	12

It will be seen from this table that the voltage of the 10-watt, 105-125-volt MAZDA lamp to order should be the same as the circuit voltage; the voltage of the 5-watt 50-65-volt MAZDA sign lamp should be half of the circuit voltage and the voltage of the 2½- and 5-watt, 10-13-volt lamp should be 1/10 of the circuit voltage.

Definitions

The terms "series wiring" and "series multiple wiring" as used in this bulletin will refer to methods of wiring as shown in Figs. 5 and 6 respectively.

Frosting

The object of frosting lamps is to produce a diffused light which tends to eliminate glare. However, as frosting slightly decreases the candle-power of the lamps, and makes it more liable to collect dirt and grease, it should not be used unless clear lamps will produce an objectionable glare. Clear lamps should therefore be used on roof signs and others which are placed fairly high above the sidewalk.

Orders should state whether lamps are to be clear, bowl-frosted, or all frosted.

Coloring

In ordering colored lamps, it should be specified whether natural or superficially colored lamps are desired.

Important

Lamps of different manufacture should not be operated in the same series, because the different lamp manufacturers may select their series lamps according to different schedules.

WIRING RECOMMENDATIONS

The method of operating MAZDA sign lamps on direct current will (in some cases) differ slightly from the approved method of operating the same lamps on alternating current. In order to prevent any possible confusion or misunderstanding, this bulletin will take up separately the lamps and methods of wiring to be used on both a-c. and d-c.

Lamps and Wiring for Alternating-Current Circuits

The methods of wiring sign lamps on alternating-current circuits are very simple. There are three lamps as well as three methods of wiring, which may be used with the present

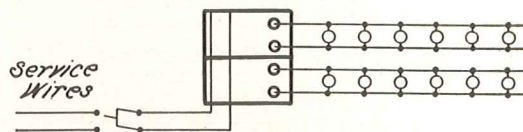


Fig. 3
SHOWING METHOD OF WIRING 10-WATT, 105-125-VOLT LAMPS IN STRAIGHT MULTIPLE

standard sign lamps and these methods are given in Table III. Considered in their order of desirability from an operating standpoint the three lamps are:

TABLE NO. III

LAMPS		Method of Wiring
Voltage	Wattage	
105-125	10	Multiple Multiple, with transformer { Series Series multiple
10- 13	2.5, 5	
50- 65	5	

10-Watt 105-125-Volt MAZDA Sign Lamps

These lamps are strong enough to successfully withstand electric sign service. They give a flood of white light and when used on

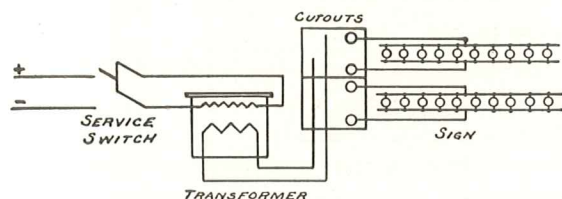


Fig. 4

MULTIPLE WIRING FOR 10-13-VOLT LAMPS
USED WITH TRANSFORMER

signs which have been properly designed make a very attractive display. The expense of a transformer is eliminated since the lamps are wired in multiple directly across the line. Another advantage of the 10-watt lamp is the small current consumption due to the comparatively high voltage of the lamp. Each lamp consumes approximately one-tenth ampere and hence the voltage drop will be negligible provided reasonable care is taken in constructing the sign. Thousands of signs

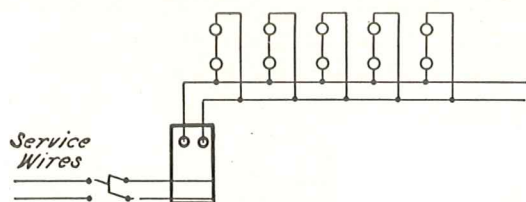


Fig. 5

50-65-VOLT LAMPS WIRED TWO IN
SERIES

are equipped with lamps of this type which are giving entire satisfaction.

2½- and 5-Watt 10-13-Volt MAZDA Sign Lamps

The advantage of these lamps is the fact that they are low wattage lamps. On very small signs it may not be desirable to use more than four candle-power and it will be found that the 2½- and 5-watt lamps are admirably suited for this purpose. They insure the customer the advantage of multiple operation which is always the best. The low voltage

of the lamps makes possible a construction which practically insures them against break-

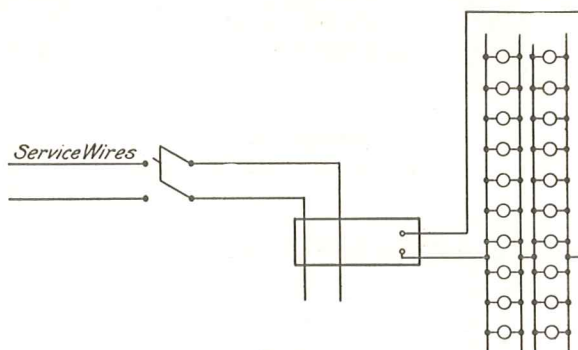


Fig. 6

50-65-VOLT LAMPS WIRED IN SERIES MULTIPLE

age. These lamps should always be wired in multiple on alternating current. This will necessitate the use of a transformer but it will be found that the transformer expense is relatively small. Fig. 4 shows a method of wiring these lamps with a transformer.

5-Watt 50-65-Volt MAZDA Sign Lamps

In general the use of these lamps on alternating current is not recommended. If for some reason it is desirable to use a 5-watt lamp and at the same time do away with

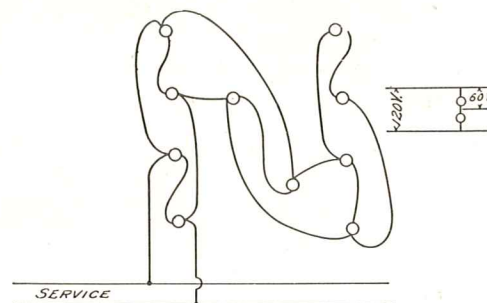


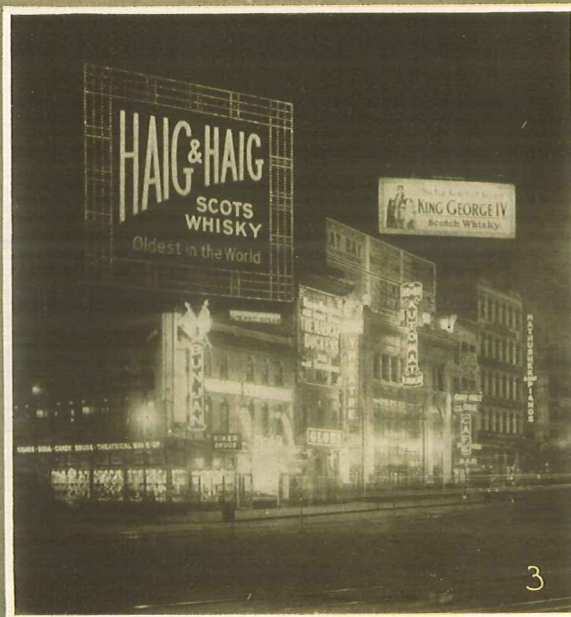
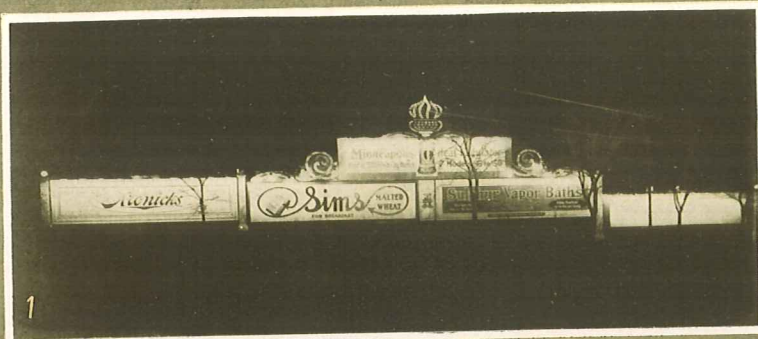
Fig. 7

METHOD OF WIRING 50-65-VOLT LAMPS IN SERIES

transformer expense, it may be used to advantage. There are two ways of wiring these lamps, as will be seen from Figs. 5 and 6.

Lamps and Wiring for Direct-Current Circuits

At one time electric signs on d-c. circuits operated at a disadvantage since it was necessary to wire them in series or series



- (1) **BILLBOARD IN MINNEAPOLIS**—This board is illuminated with 100-watt MAZDA lamps in special reflectors. The scroll work at the top is lighted with 500 5-watt 12-volt MAZDA lamps equipped with color caps. These lamps are connected to a flasher and the effect is that of a running line from the ends toward the flaming torch in the center.
- (2) **THE NEW HOME OF THE NEW YORK EDISON COMPANY**—The building is outlined with approximately 4000 5- and 10-watt EDISON MAZDA sign lamps. The 5-watt 60-volt sign lamps are wired in series multiple as shown in Fig. 7.
- (3) **HAIG & HAIG**—The sign is 50 feet high by 50 feet long. The first "H" is 26 feet high and the last "G" is nine and one-half feet high.
- (4) **BILLBOARD IN DETROIT**—This billboard is illuminated with 100-watt MAZDA lamps placed in special reflectors. The scroll work is studded with 300-watt MAZDA sign lamps. On the top of each ornamental post at the ends is a 100-watt MAZDA lamp.

multiple with 10-13-volt MAZDA lamps. This handicap has fortunately been removed by the 10-watt, 105-125-volt and the 5-watt 50-65-volt EDISON MAZDA sign lamps. There is no reason now why electric sign lighting should not make as rapid progress in cities supplied with direct current as in cities supplied with alternating current.

Table IV gives the lamps and methods of wiring for direct current arranged in their order of desirability from an operating standpoint.

TABLE NO. IV

LAMPS		Method of Wiring
Voltage	Wattage	
105-125	10	Multiple Series Series multiple
50-65	5	

10-Watt 105-125-Volt MAZDA Sign Lamps

The 10-watt sign lamps make it possible to wire the sign in multiple, this being the most simple and satisfactory method. The transformer expense is therefore eliminated, and this will offset the slightly higher renewal cost of the lamps.

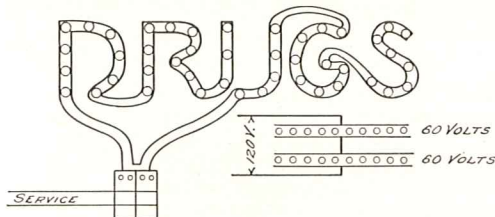


Fig. 8

METHOD OF WIRING 50-65-VOLT LAMPS IN SERIES MULTIPLE

Old signs containing 20- or 30-watt carbon sign lamps can be relamped with the 10-watt MAZDA lamp to the decided advantage of the merchant. This change will result in a material saving to the customer and at the same time greatly improve the appearance of his sign. The 10-watt lamps have been thoroughly tried out and are giving excellent performance in thousands of electric signs. Numerous service tests have been made

and it has been demonstrated that the rated life, as given in this bulletin, has been upheld.

On circuits of 220 volts d-c. it is recommended that these lamps be used and wired two in series.

5-Watt 50-65-Volt MAZDA Sign Lamps

In some cases it may be found that the 10-watt lamp gives too much light and accordingly impairs the legibility of the sign. If this is the case it is recommended that the 5-watt 50-65-volt lamp be used. These lamps may be wired either two in series or in series multiple, as shown in Figs. 5 and 6. In the case of a double faced sign it is recommended that the lamps on each side be wired in multiple and the two sides be connected in series. In this way we get a condition of operation which is practically similar to straight multiple service.

Whenever these lamps are wired in series multiple, as shown in Fig. 6, it is recommended that not less than 20 lamps be used in each group, thus making a minimum of 40 lamps in the sign. When a comparatively large number of lamps are used the failure of any one lamp will not unbalance the circuit to any great extent.

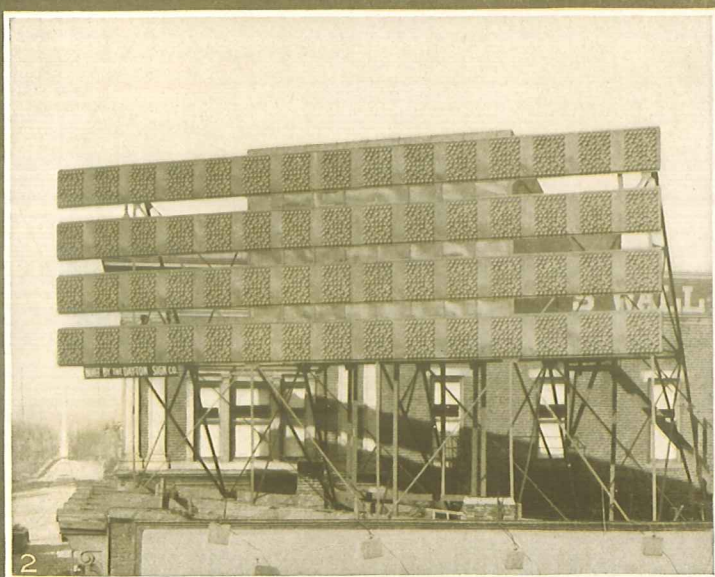
Fig. 7 shows a method of wiring the letter "N" with 60-volt lamps by connecting two lamps in series. Fig. 8 shows a method of wiring the word "Drugs" by connecting the lamps in series multiple. From this figure it will be observed that the circuits are connected in series in the cutout box and in this way a number of old signs can be changed over very readily by connecting each two circuits in series, it being assumed, of course, that there are an equal number of lamps in each circuit.

BILLBOARD LIGHTING

The advertising value of a billboard depends upon its attractiveness and also upon the length of time the display is before the public each day. Throughout the country there are many thousands of signs of real advertising value which cease to work at



- (1) HOTEL ROSSLYN—A most effective way of advertising the location of a hotel. This sign contains 1400 10-watt EDISON MAZDA sign lamps. It is located in Los Angeles, Cal.
- (3) ST. JOSEPH'S SLOGAN SIGN—Presented to the City of St. Joseph by the St. Joseph Railway, Light, Heat & Power Company. It contains 3800 10-watt EDISON MAZDA lamps, all of which are covered with either amber, green, red or opal color caps.
- (4) GREATER, BRIGHTER DAYTON—The Dayton Power & Light Company erected this sign at the time of the flood in order to boost the reconstruction of the city. The sign is 28 feet by 18 feet and contains 825 10- and 15-watt MAZDA sign lamps.
- (5) ROCHESTER, N. Y., SLOGAN SIGN—Erected by the Rochester Chamber of Commerce and is located along the lines of the New York Central. Ten-watt EDISON MAZDA sign lamps are used in the display.



(1-3) **ELECTRIC NEWS BULLETIN**—This sign is located in Dayton, Ohio, and uses 3180 5-watt EDISON MAZDA sign lamps. The structure proper is 42 feet long and 15 feet high. The sign consists of 60 monograms, arranged in four rows, 15 in a row. Each monogram contains 53 lamps so arranged that each letter or character can be flashed instantly at the will of the operator. The keyboard which operates the sign is eight feet long and four feet high and resembles the keyboard of a large typewriter. Anything can be flashed instantly, such as newspaper bulletins, baseball scores, etc. Two night views are shown in the attached prints.



- (1) WASHINGTON MARKET—This sign is located in San Francisco, contains 2000 5- and 10-watt EDISON MAZDA sign lamps.
- (2) OCCIDENT FLOUR—This board, which is erected in Minneapolis, is lighted with 100-watt MAZDA lamps placed in individual conical reflectors. The ornamental posts at each end support a lamp from an iron bracket. The lower board is illuminated with 100-watt lamps placed at the ends of the projecting beams. Each post is illuminated with 100-watt lamps at the top.
- (3) NEWSOM AUTO RENT COMPANY—A sign in Atlanta, Ga., which contains 5-watt 60-volt EDISON MAZDA sign lamps wired two in series.
- (4) THE PATRIOT—That newspapers appreciate the value of electric signs is shown in the case of this sign, which is located in Harrisburg, Pa.

sundown. Whatever proportion of their cost may be attributed to their location or other detail of merit becomes entirely waste during dark hours.

The cost of illumination is justified by the increased "circulation" and the resulting decrease in cost per capita of readers. The photographs in this bulletin show very clearly that the expense of illumination is justified. The boards become much more attractive and attention-compelling in the evening than during the day. Some of these illuminated billboards have ornamental scroll work studded with small incandescent lamps, which adds to the attractiveness of the sign. It is possible for the consumer to get very effective advertising for small expense out of a billboard of this nature.

There are a number of satisfactory billboard reflectors on the market and they can be installed at a very reasonable expense. The accepted practice of lighting is to equip the reflectors with either 60-watt or 100-watt MAZDA lamps. These lamps are strong and will withstand the severe vibration to which they are subjected.

SLOGAN LIGHTING

It may not be generally known that within the confines of the United States there are 125 cities that have adopted "slogans" as a means of furthering their interests. Electric signs bearing the slogan advertise the ambitions and advantages of the respective cities far and near to inhabitants and visitors. It has been demonstrated that a city can, to advantage, advertise its opportunities to the public. There is no more effective way for a city to advertise its advantages than an electric sign. Such a sign not only firmly fixes the geographical location of a city in the mind of a traveler, but at the same time advertises its industries.

A newspaper in a prominent city has this to say concerning the slogan sign, which was recently erected: "It has awakened civic pride and shown what can be accomplished by artistic electric sign illumination and stimulated the entire electrical growth of the city."

Has your city a slogan sign? Does it flash its message every night in electric letters so that all who run may read, so that citizens in your community may take just pride in their city as a progressive and up-to-the-minute user of electricity and advertising.

Outline Building Display Lighting

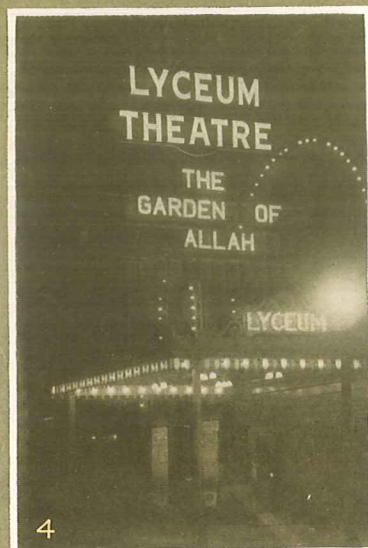
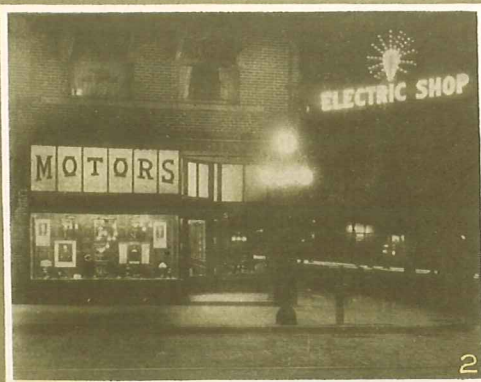
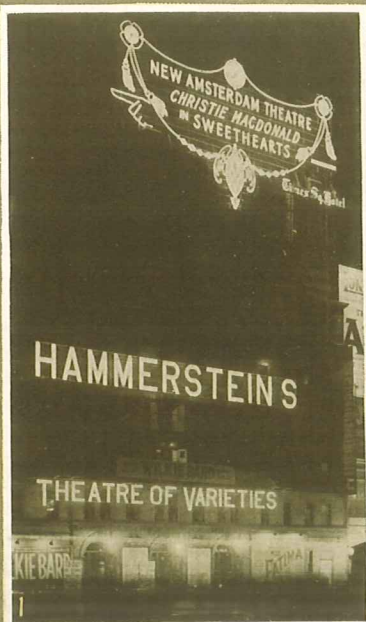
There is no form of illumination more attractive or more productive than outline and decorative building lighting. It is a dignified and effective method of advertising which produces results. In the past it has not been employed very extensively for various reasons, chiefly the inefficiency of the old carbon lamps.

The advent of the EDISON MAZDA sign lamps, especially the 10-watt, 105-125-volt, has opened a way for more extensive outline lighting by reducing the operating expense of installations while increasing their attractiveness. The illustrations in this bulletin show what can be accomplished by a carefully planned system of outline lighting. The new home of the New York Edison Company shown in the group on page 8 arouses the admiration of all who see it. The striking results were obtained by extensive and painstaking experiments by the illuminating engineers of that company.

In every city there are a few buildings at least which can be illuminated in somewhat the same manner as shown in these illustrations. Such installations are certain to accrue to the material advantage of both the central station and the owner of the building. A vigorous campaign inaugurated by a central station will undoubtedly result in a number of installations. It is to be hoped that in the near future striking examples of such spectacular illumination may be found in every city.

PROJECTOR LIGHTING OF PAINTED SIGNS

It frequently happens that painted signs are so located that power is not easily available at the sign itself, or structural conditions may not warrant the expense of wiring; such for example, as signs painted on water tanks.



- (1) NEW AMSTERDAM THEATER—The sign is 31 feet high by 90 feet long and contains a total of 2590 10-watt EDISON MAZDA sign lamps. The letters are four feet high.
- (2) CARTER'S ELECTRIC SHOP, KOKOMO, IND.
- (3) "WELCOME B.P.O.E."—For temporary display lighting, nothing is so effective as MAZDA sign lamps. This attractive display was erected in Rochester, N. Y., during the Elks' 1914 convention.
- (4) LYCEUM THEATER—A changeable type of letter is used which facilitates the changing of the sign with changing of the bill. Ten-watt MAZDA lamps are used.
- (5) BUDWEISER BILLBOARD—Fourteen 100-watt lamps in special reflectors illuminate this board which is located in Detroit.

billboards located some distance from transmission lines, etc. Such signs may be well lighted by projecting a beam of light on them from a distance. A number of installations of this nature have already been made, the results being particularly striking as well as pleasing. This is especially true in the case of buildings constructed of terra cotta. Billboards, in order to be effective, should be painted in light colors.

The light is projected on the building or sign by means of one or more parabolic reflectors, which can be located on adjacent buildings in such a way as to give uniform illumination over the entire surface to be lighted.

A billboard was recently lighted in this way by a reflector placed about 200 feet from the sign, while another was illuminated at a distance of 500 feet by using a 500-watt MAZDA C stereopticon lamp in a 16-inch parabolic reflector.

It is evident, therefore, that towers, signs and water tanks which are comparatively inaccessible, can be illuminated in this manner with very little initial cost and at low operating expense, and results can be obtained which without considerable expenditure would be impossible but for the use of the efficient EDISON MAZDA lamps in proper reflectors.

The projectors used for this class of work consist of 16-inch polished aluminum parabolic reflectors of 3-inch focus, in weather-proof housings (General Electric Company's Incandescent Headlight J-11, Cat. No. 144592).

Where the beam is to be projected to a distance of 200 feet or more, it is necessary to use the highly concentrated filament found

in the 500-watt G-40 bulb MAZDA stereopticon lamp. This lamp properly focused in the J-11 headlight will deliver a beam having a spread of about 6 deg. (10.5 feet in 100). With the lamp filament located about one-half inch back of the focus, this spread may be increased to approximately 18 deg. (30.9 feet in 100). For short range projection, i.e., up to 200 feet the regular 500-watt S-40 bulb MAZDA C lamp is satisfactory and gives a spread of about 10 deg. (17.5 feet in 100).

WIRING

For low voltage MAZDA sign lamps the wiring must be such that the voltage drop does not exceed a certain definite amount. Care must also be taken to see that the Fire Underwriters' Rules are not voided. According to specifications of the National Board of Fire Underwriters, not more than 1320 watts shall be dependent upon the final cutout. In some cases, however, the municipal rules allow only 660 watts, when wiring must be arranged accordingly. Table V shows the carrying capacity of wires as approved by the National Board of Fire Underwriters. It can be seen that with low voltage lamps the carrying capacity of the wires is a governing feature.

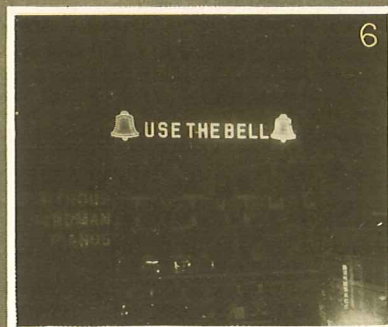
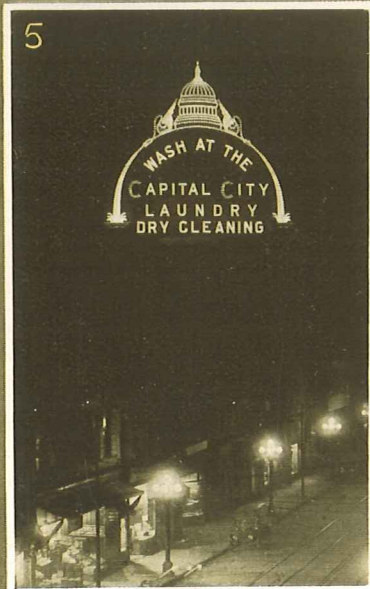
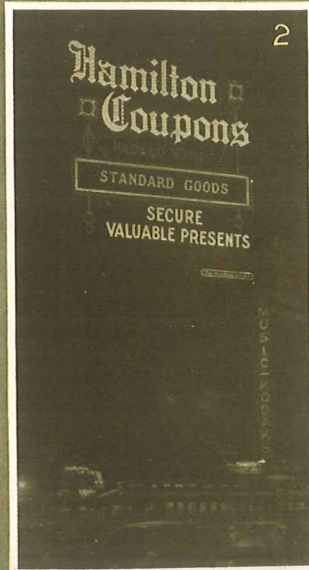
With the 10-13-volt lamps it is essential that the voltage drop in all cases be less than one-half volt. It can readily be appreciated that if a larger actual drop were allowed the percentage drop would be considerable. For instance, a drop of one volt, although comparatively small, in the case of 100-volt lamps means a drop of 10 per cent for a 10-volt lamp, which is entirely too large. Table

TABLE NO. V

THE RELATION BETWEEN SIZE OF WIRE AND NUMBER AND SPACING OF LAMPS FOR DROP OF 1/2 VOLT

Spacing of Lamps in Inches	SIZE OF RUBBER COVERED WIRE (B.&S.)				Number of 5-watt, 10-13-volt lamps
	14	12	10	8	
3	* 48	* 68	* 96	* 132	
6	* 48	* 68	88	112	
8	47	60	75	97	
10	42	54	68	86	
12	38	49	62	79	
16	33	42	54	68	
20	29	38	48	61	

* This limit is necessary in order not to exceed the safe carrying capacity of rubber covered wire.



- (1) STROH'S SIGN—Located in Detroit, Mich. It is 72 feet long by 62 feet high. The border contains 2720 2½-watt 12-volt MAZDA sign lamps and the rest of the sign uses 1060 5-watt 12-volt sign lamps. The illuminated billboard directly beneath is illuminated with 100-watt MAZDA lamps.
- (2) HAMILTON COUPONS—The sign is 36 feet by 42 feet high by 42 feet long and contains a total of 2114 MAZDA sign lamps. It has an ornamental border of colored lamps.
- (3) QUINN'S SUPERBA—A wonderful effect is produced by the use of 6200 EDISON MAZDA sign lamps. It is located in Los Angeles, Cal.
- (4) FATIMA SIGN—A sign which uses approximately 1900 EDISON MAZDA sign lamps. Color caps are used in the border which gives it a very ornamental effect.
- (5) CAPITOL CITY LAUNDRY—A prominent sign in Atlanta, Ga., containing 5-watt EDISON MAZDA sign lamps.
- (6) BELL TELEPHONE—This sign, which is located in Harrisburg, Pa., shows that Bell Telephone Company believes in electric signs.

VI gives the number of lamps (assuming the circuit is fed at the middle) which can be used on the five different sizes of wire when the lamps are spaced at various intervals, in order that the drop may not exceed one-half volt.

Table VII gives the maximum number of 5-watt 10-13-volt lamps wired in multiple which can be supplied with feeders having the sizes and length given in the table with a drop not exceeding 0.2 volt.

Fig. 9 shows four possible methods of connecting feeders to a sign, and Table VII shows data for each method. Since there

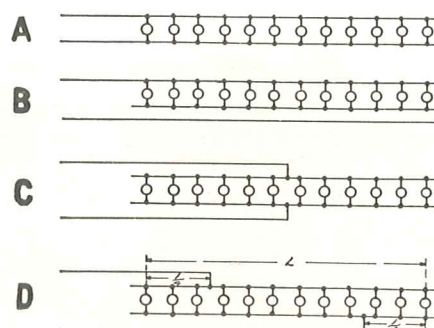


Fig. 9

FOUR POSSIBLE METHODS OF CONNECTING FEEDERS TO A SIGN

TABLE NO. VI
THE RELATION BETWEEN LENGTH AND SIZE OF FEEDERS, AND THE NUMBER OF LAMPS
FOR A DROP NOT EXCEEDING 0.2 VOLT

Combined Length of Pair of Feeders	SIZE OF FEEDER (B.&S.)					Number of 5-watt, 10-13-volt lamps
	10	8	6	4	2	
3	* 64	* 92	* 130	* 184	* 262	
4	50	77	125	* 184	* 262	
5	40	62	100	158	254	
6	33	53	84	135	210	
8	25	40	63	101	160	
10	20	31	50	79	127	
15	13	21	33	53	85	
20	10	15	25	39	63	
30	7	10	17	26	42	

* This limit is necessary in order not to exceed the safe carrying capacity of weather-proof wire.

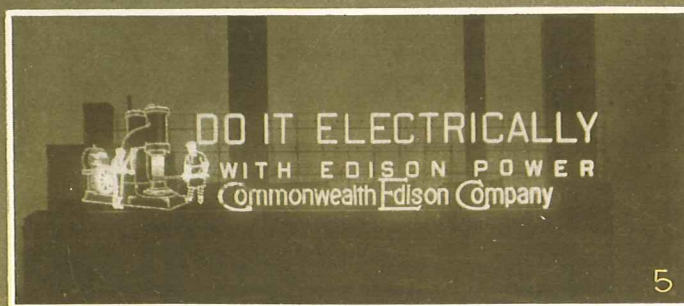
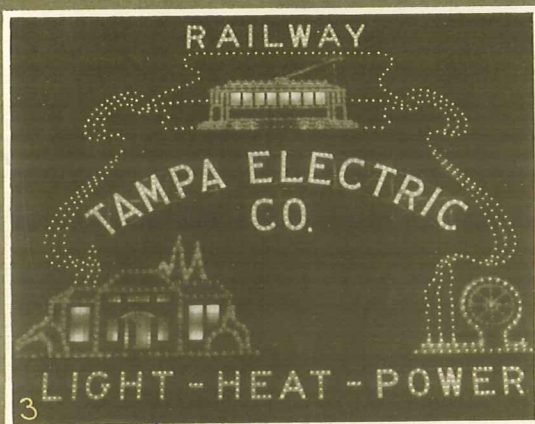
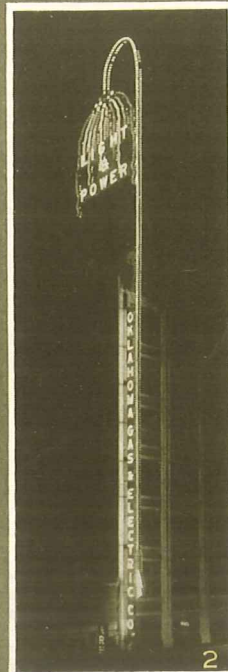
TABLE NO. VII
CARRYING CAPACITY OF WIRES AS APPROVED BY THE NATIONAL BOARD OF FIRE UNDERWRITERS

B.&S. Gauge	Rubber Insulation Amperes	No. 5-Watt 10-13 Volts	No. 5-Watt 50-65 Volts	No. 10-Watt 100-103 Volts
14	12	26	137	137
12	17	39	195	†
10	24	55	†	...
8	33	76	...	...
6	46	106	...	...
5	54	124	...	...
4	65	150	...	...
3	76	175	...	...
2	90	207	...	...
1	107	248	...	...
0	127	†	...	...

† Exceeds the 1320 watts as allowed by National Board of Fire Underwriters.

TABLE NO. VIII
COMPARISON OF VOLTAGE DROP FOR THE FOUR METHODS OF WIRING SHOWN IN FIG. 9

Wiring System	Minimum Drop	Average Drop	Maximum Drop	Maximum Voltage Difference
A	0	2/3	1	1
B	1/2	2/3	3/4	1/4
C	0	1/6	1/4	1/4
D	1/4	7/24	5/16	1/16



- (1) **COOK WITH GAS**—This sign is located on the Electric and Gas Building in Atlanta, Ga. The exterior illumination is produced by 750-watt EDISON MAZDA lamps.
- (2) **OKLAHOMA GAS & ELECTRIC COMPANY**—The sign, located on the Oklahoma Gas & Electric Company's office, operates as follows: The upward flight of the rocket first appears, followed by an explosion, after which streams of light shoot to the top of the building. The words "Light and Power" and the vertical sign are flashed on, and then the operation is repeated.
- (3) **TAMPA ELECTRIC COMPANY**—A very effective sign for a central station.
- (4) **GET A FAN AND KEEP COOL**—The sign is maintained by the Rochester Railway & Light Company, and used for advertising its own product. A stock of letters is kept on hand and seasonable advertising is possible. In each corner is a group of red lamps connected to a flasher which give a coiling effect when in operation.
- (5) **COMMONWEALTH EDISON COMPANY**—A very striking sign, located on the Power House of the Commonwealth Edison Company and using MAZDA sign lamps.

are, therefore, at least four ways in which it can be done, it is evident that one method will give the best results. The figures given in the table are relative, it being assumed that the maximum voltage drop in system "A" be unity. The most desirable system would obviously be the one which would produce the least average drop and also the minimum difference between the maximum and minimum voltage drops. Of these two considerations, the latter is of most importance. As the systems are arranged, system "A" would give the poorest results and system "D" the best results. Unfortunately, nearly all signs are wired according to system "A," but wherever 105-125-volt lamps are used this is not serious, but with low voltage lamps the heavy currents, which naturally result, will cause a large difference in voltage, resulting in a large variation in candle-power in the lamps at opposite ends of the circuit.

Since the difference in voltage given in system "D" is only one-sixteenth of that in system "A," it should be used, as the lamps will then all operate at practically the same efficiency, giving uniform life and candle-power. It is, therefore, recommended that in the future all feeders be connected as shown in "D."

With the 50-65-volt 5-watt, and the 105-125-volt 10-watt lamps the governing feature is a limit of 1320 watts imposed by the National Board of Fire Underwriters, since the amperage is very low.

It is, however, suggested that in the wiring of signs which are to accommodate low-voltage lamps, the size of wire should be calculated very carefully, in order that the best possible service may result. "Rule of thumb" methods will not give satisfactory results as has been proved in a number of instances.

Changing Old Signs from Carbon to MAZDA Lamps

In cities having alternating current the old sign containing carbon lamps can be very easily changed to MAZDA. If it has been decided to use the 10-13-volt lamp it can be

accommodated very easily by simply inserting a transformer between the sign and the service wires. Care should be taken, however, to see that the old wiring in the sign is heavy enough to take care of the increased amperage from the low wattage lamps.

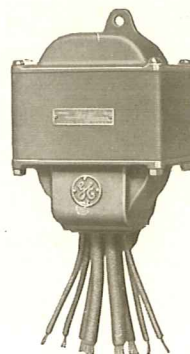
The change to 105-125-volt 10-watt EDISON MAZDA lamps can be very easily made without any changes in wiring or the addition of any apparatus. This is undoubtedly the simplest and most satisfactory way of making the change and is the method which will be largely used.

Any existing carbon sign can be changed over to accommodate the 50-65-volt 5-watt lamp, provided it is a double faced sign, with one circuit for each side, or provided the circuits are so arranged that one or more can be balanced against the other circuits having an equal number of lamps. These changes can easily be made in the cutout box without any appreciable expense.

It is, therefore, possible to change over every carbon sign to MAZDA lamps, show a saving in operating cost, and at the same time greatly improve its appearance.

General Electric Sign Lighting Transformers

The General Electric Company has developed a complete line of transformers for



TRANSFORMER FOR SIGN LIGHTING

reducing the circuit voltage to that of the MAZDA sign lamp. The transformation ratio is 10:1 and 20:1, and, consequently, with a primary voltage approaching 110,

10-volt lamps should be used, and with a primary voltage of 120, 12-volt lamps should be used, etc. These transformers are made in four standard sizes shown in Table IX.

As the secondary can be connected for either two- or three-wire service, the transformers can therefore be applied to any sign without necessitating any change in wiring.

Flashers

The advantage of the flasher is obvious: It gives movement which attracts attention, makes possible many spectacular effects and reduces the amount of current necessary to operate a given sign. In order to save core

loss, and also because flashers will operate more satisfactorily on 110 volts, it is recommended that whenever possible the flasher be placed on the high voltage side of the transformer. However, the simple "on and off" flashing sign is the only type that can be so arranged because the several circuits must be brought together to the flasher, and cannot be united in the transformer on the way.

In Table X are given the various kinds of flashing effect with the corresponding possible methods of wiring on either direct or alternating current. A type of lamp which can be used in order to produce this flashing effect is shown in the last column.

TABLE NO. IX
G-E SIGN LIGHTING TRANSFORMERS

Capacity Watts	Capacity 5-Watt Lamp	Wall Space Inches	Depth Inches	Net Weight Pounds	Catalog Number
250	50	7x6 $\frac{1}{4}$	5 $\frac{1}{2}$	30	76676
500	100	8x8	7 $\frac{1}{4}$	45	76678
1000	200	9x9	9	70	76680
2000	400	10 $\frac{1}{2}$ x10	10	100	76683

TABLE NO. X
POSSIBLE SYSTEMS OF WIRING AND LAMPS TO USE FOR VARIOUS FLASHING EFFECTS

Flashing Effect	Current	Wiring	Lamps
Steady burning On and off	A-C. or D-C.	{ Multiple	110-volt MAZDA
One line at a time	A-C.	{ Series multiple Two in series Mult. with trans.	55-volt MAZDA 55-volt MAZDA 10-volt MAZDA
Script Spelling Fountain	D-C. or A-C.	Multiple	110-volt MAZDA
Rat Chaser Falling Water Lightning	A-C.	{ Multiple with trans.	10-volt MAZDA

